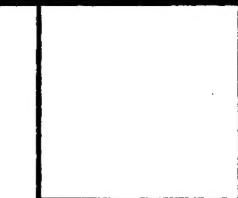


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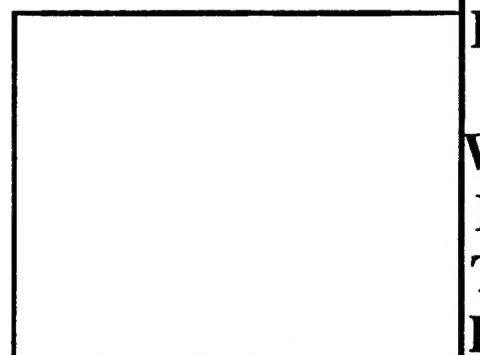
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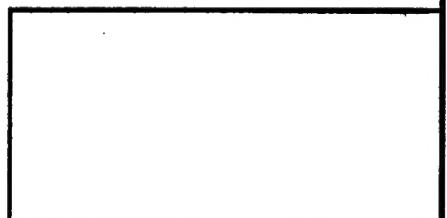
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23 April 1999

Major Ed Marchand
AFCEE/ERT
3207 North Road, Bldg. 532
Brooks AFB, Texas 78235-5363



Subject: Final Confirmation Sampling and Analysis Report for the POL Yard, Sites SS-06 and ST-40, Wurtsmith AFB, Michigan (Contract No. F41624-92-8036, Order 17)

Dear Major Marchand:

Please find enclosed three copies of the Final Confirmation Sampling and Analysis Report for the Petroleum, Oils, and Lubricants (POL) Yard, Sites SS-06 and ST-40, Wurtsmith Air Force Base (AFB), Michigan. This report was prepared by Parsons Engineering Science, Inc. (Parsons ES) for the Air Force Center for Environmental Excellence, Technology Transfer Division (AFCEE/ERT) and the Wurtsmith Air Force Base Conversion Agency (AFBCA/OL-T). Copies of this report have also been sent to Mr. Paul Rekowski of Wurtsmith AFBCA/OL-T, Ms. Laura Ripley at the United States Environmental Protection Agency (USEPA) Region 5, Mr. Bruce Moore at the Michigan Department of Environmental Quality (MDEQ), and Mr. Tom Pavlik of the Snell Environmental Group (SEG).

This report incorporates comments received from Mr. Bruce Moore of the MDEQ and Ms. Laura Ripley of the USEPA on the draft final confirmation sampling and analysis report. Wurtsmith AFBCA and AFCEE/ERT had no comments on the draft final report. This report represents the final contract deliverable for the AFCEE Extended Bioventing Project at the Wurtsmith AFB POL Yard. If you have any questions or comments regarding this package, please call John Hall at (970) 244-8829, or me at (303) 831-8100.

Sincerely,
PARSONS ENGINEERING SCIENCE, INC.


John Ratz, P.E.
Project Manager

Enclosures

cc: Mr. Paul Rekowski, Wurtsmith AFBCA/OL-T (3 copies)
Ms. Laura Ripley, USEPA Region 5 (1 copy)
Mr. Bruce Moore, MDEQ (1 copy)
Mr. Tom Pavlik, Snell Environmental Group (1 copy)
Mr. John Hall, Parsons ES-Grand Junction (1 copy)
File 726876.69123.M
File 726876.01000.H (letter of transmittal only)

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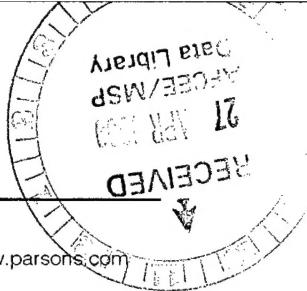
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23 April 1999

Major Ed Marchand
AFCEE/ERT
3207 North Road, Bldg. 532
Brooks AFB, TX 78235-5363

Subject: Responses to MDEQ and USEPA Comments on the Draft Final Confirmation Sampling and Analysis Report for the POL Yard, Sites SS-06 and ST-40, Wurtsmith AFB, Michigan (Contract F41624-92-D-8036, Order 17)

Dear Major Marchand:

This letter has been written to provide responses to comments received on the Draft Final Confirmation Sampling and Analysis Report for the Petroleum, Oils, and Lubricants (POL) Yard, Sites SS-06 and ST-40, Wurtsmith Air Force Base (AFB), Michigan. The draft final report was prepared by Parsons Engineering Science, Inc. (Parsons ES) for the Air Force Center for Environmental Excellence, Technology Transfer Division (AFCEE/ERT); the Wurtsmith Air Force Base Conversion Agency (AFBCA/OL-T); the Michigan Department of Environmental Quality (MDEQ); and the United States Environmental Protection Agency (USEPA). AFCEE/ERT and the Wurtsmith AFBCA/OL-T had no comments on the draft final report.

Responses to MDEQ Comments: 31 March 1999 letter from Mr. Bruce Moore (MDEQ) to Mr. Paul Rekowski (Wurtsmith AFBCA/OL-T)

Comments: The MDEQ supports the conclusions of the report and recommends continued operation of the extended bioventing project with monitoring. Other comments follow:

Methanol preservation techniques (Method 5035) were used to conduct soil sampling at SS-06. This sampling technique was not available during prior site investigations conducted in 1995/1996. The conclusion that some soil Volatile Organic Compound (VOC) concentrations may have risen during the period of operation of the bioventing system, may not be a correct assumption. Prior sampling techniques were not accurate and often underestimated contaminant concentrations in most sampling. In our opinion, the 1995/1996 data may not have been accurate for VOC concentrations. The actual levels, if measured using Method 5035 would have been significantly higher. We believe that VOC concentrations are most likely lower now than they were at the start of the bioventing project.



evidence indicate that bioventing has been effective in reducing contaminant mass in both shallow and smear-zone soils.

1.) The consistent, significant contaminant reduction observed in the sample pairs (SB40-002/SB2 and VW2/SB9) collected above the smear zone (between 14 and 17 feet bgs), and lack of significant contamination detected in shallow soils elsewhere at the site, is strong evidence that bioventing has effectively reduced contaminant mass in unsaturated soils at the site.

2.) There was an overall reduction in total BTEX concentrations measured in the 5 sample pairs collected in the smear zone (SB40-001/SB1, SB40-002/SB2, VW7/SB3, VW5/SB5, and MPB/SB13). Large reductions in total BTEX concentration was observed in two pairs (SB40-001/SB1 and VW7/SB3); a lesser reduction was observed in one pair (MPB/SB13); an insignificant change in total BTEX concentration was observed in one pair (VW5/SB5); and an increase was observed in only one pair (SB40-002/SB2).

3.) Respiration rates measured at monitoring points screened in the smear zone indicate that biodegradation of fuel hydrocarbons is occurring at rates generally exceeding 1,000 mg/kg per year (Parsons ES, 1998).

4.) Large reductions in soil gas BTEX concentrations in pre-bioventing samples compared to post-bioventing samples collected from the smear zone (Parsons ES, 1998).

Considering this evidence, it may reasonably be assumed that bioventing is reducing contaminant mass in smear zone soils during times of the year when these soils are unsaturated. However, because a portion of the smear zone is saturated part of the year, the average rate of contaminant mass reduction in the smear zone is less than the rate in soils that are constantly unsaturated. Although the rates are lower in the smear zone, contaminant mass reduction is nonetheless being achieved in the smear zone as the result of bioventing. No changes will be made to the final report.

Comment 3a) *Page 4-1, Conclusions and Recommendations* - If the bioventing system does not effectively reduce fuel hydrocarbon concentrations in site soils in the smear zone, can the current bioventing system be modified to treat this smear zone soil contamination?

Parsons ES Response: The only technically feasible means of improving the effectiveness of bioventing for smear zone soils would be to install and operate a groundwater extraction system that would cause local drawdown in the groundwater table and expose the smear zone to continuous treatment using *in situ* bioventing. This is a very expensive option,

The purpose for going to the 5035 Method is to obtain a more consistent and accurate analytical result.

We support the continued operation of the bioventing project and agree with the recommendation that sampling be conducted during low water table conditions.

Parsons ES Response: Parsons ES will add text to Section 3.1 of the final report that states that the SW5035 extraction technique was used during the October 1998 sampling event, but was not used during the 1995 and 1996 sampling events, which could partially account for the apparent contaminant increases in smear zone soils.

Responses to USEPA, Region 5 Comments: 10 March 1999 letter from Ms. Laura Ripley (USEPA, Region 5) to Mr. Paul Rekowski (Wurtsmith AFBCA/OL-T)

Comment 1) *Page 3-1, Section 3.1, Laboratory Results* - In the text, please indicate the shallow depths at which significant concentrations of organic compounds were detected in SB14 and SB16.

Parsons ES Response: The first sentence of the second paragraph of Section 3.1 will be modified to read, "The only significant concentrations of organic compounds detected in shallow soils (above the smear zone) were 1,3,5-TMB at SB14 (from 10 to 12 feet bgs) and SB16 (from 6 to 8 feet bgs), and xylenes at SB14 (from 10 to 12 feet bgs).

Comment 2) *Page 3-3, First Complete Paragraph, Table 3.2* - It would appear that the concentrations for sample pair MPB/SB13 indicates an increase in benzene concentrations and a minimal decrease in ethylbenzene and total xylenes. EPA agrees that the bioventing system appears to be reducing residual fuel hydrocarbon concentrations in shallow site soils. However, EPA does not agree that the operation of the bioventing system is effectively reducing residual fuels in the smear zone. Only two of the five sample pairs in the smear zone indicate a decrease.

Parsons ES Response: Because the majority of pre-bioventing soil samples were collected from the upper portion of the smear zone (because of relatively high groundwater levels at the time of sampling) and most post-bioventing samples were collected from the lower portion of the smear zone (because of relatively low groundwater levels) it is difficult to quantify the effectiveness of bioventing by comparing sample pairs. Because of the inherent variability in results for soil samples, combined with the fact that most soil sample pairs listed in Table 3.2 were collected from slightly different depths and at varying horizontal separations, comparison of the results of these sample pairs indicate only general trends. An additional factor preventing a direct comparison is that different methods were used to analyze the pre- and post-bioventing soil samples (see MDEQ comment/responses). However, several lines of

because system installation costs would be high, and operations and maintenance costs would increase significantly because extracted groundwater would require treatment and disposal. Although bioventing wells could be retrofitted as air sparging wells, the radius of influence of each well would be insignificant (less than 5 feet) and would not provide full-scale coverage of the smear zone. Parsons ES recommends continued operation of the current system, relying on seasonal fluctuations in the groundwater table and diffusion of oxygen into saturated soils, to achieve contaminant reduction in the smear zone soils.

Comment 3b) Is there a projected time frame for when the smear-zone soils will be remediated?

Parsons ES Response: An accurate estimate for the time required to remediate smear zone soils to target levels cannot be made with the data that is currently available. The timeframe required for remediation will depend primarily on the precipitation rates and the elevation of the groundwater table over the next one to five years. If precipitation rates are lower than average, then the groundwater table will remain low and the smear zone will remain unsaturated and exposed for treatment using bioventing, and treatment will occur at an accelerated rate. If precipitation rates are higher than average, then the groundwater table will be elevated, greater thicknesses of the smear zone will remain saturated, and a greater length of time will be required to achieve cleanup. No changes will be made to the final report.

Comment 3c) In recommending annual soil gas sampling and respiration testing, how will this information indicate that the deeper smear-zone soil contamination has reached lower levels?

Parsons ES Response: Parsons ES has recommended that future soil gas sampling and respiration testing events be conducted during low water table conditions to ensure that the smear zone soils are unsaturated during sampling and testing. Annual soil gas sampling will provide data used to determine the relative reduction in BTEX concentrations in soil gas in the smear zone soils, and will also provide data to determine if a significant oxygen demand still exists in contaminated soils. Respiration testing will provide the rates of oxygen and fuel hydrocarbon consumption by soil bacteria. Significant decreases in respiration rates would indicate a reduction in the biologically available substrate (fuel hydrocarbons) remaining in the smear zone soils. Decreases in respiration rates and in soil gas BTEX concentrations would indicate that concentrations of BTEX in the soil have decreased significantly. Respiration rates and soil gas BTEX concentrations provide only general indicators of residual soil contaminant concentrations, and future soil sampling would be required to determine actual reduction of BTEX in smear-zone soils. No changes will be made to the final report.

Comment 4a) *Appendix C, Laboratory Analytical Results and COC Forms* -There is only one Federal Express Airbill located in this appendix from the cooler shipped on 10/15/98 and received by the lab on 10/16/98. Please include the other two Federal Express Airbills for the coolers shipped on 10/14/98 and 10/16/98, respectively.

Parsons ES Response: The Federal Express airbills for the coolers shipped on 10/14/98 and 10/16/98 will be included in Appendix C of the final report.

Comment 4b) Appendix A, Table D.2 indicates that the soil samples being analyzed for volatile organic compounds required a holding time of 48 hours from collection to extraction and 14 days from collection to analysis. From the information presented in Appendix C it would appear the 14 days holding time was respected. It is unclear as to whether or not the holding time of 48 hours from collection to extraction was respected. Please provide some additional information from the laboratory about the holding time from collection to extraction.

Parsons ES Response: Parsons ES has obtained the handwritten sample extraction logs from Specialized Assays, Inc. (SAI) of Nashville, Tennessee, the analytical laboratory that performed the sample analysis for the October 1998 soil sampling effort. These sample extraction logs will be included in Appendix C of the final report. Although the exact times of sample extraction were not noted for each sample, it appears that the 48-hour holding time was met for all analyses. A comparison of sample collection date and time against the extraction date appears in the following paragraphs.

The six soil samples collected between 1610 on 13 October and 1130 on 14 October 1998, and submitted to SAI under the chain of custody (COC) signed by Mr. John Hall of Parsons ES on 14 October 1998 (SB1-16, SB1-19, SB12-16, SB2-20, SB3-22, and SB4-22), were extracted on 15 October 1998.

The twelve soil samples collected between 1430 on 14 October and 1020 on 15 October 1998, and submitted to SAI under the COC signed by Mr. Hall on 15 October 1998 (SB25-23, SB5-23, SB5-12, SB18A-20, SB7-20, SB28-21, SB8-21, SB6-22, SB9-14, SB9-14MS, SB9-14MSD, and SB9-22), were extracted on 16 October 1998.

The fourteen soil samples collected between 1310 on 15 October 1998 and 0950 on 16 October 1998, and submitted to SAI under the COC signed by Mr. Hall on 16 October 1998 (SB13-21, SB11-21, SB16-8, SB16-21, SB14-21, SB26-21, SB14-12, SB12-22, SB17-26, SB15-22, SB15-10-12, SB15-10-12MS, SB15-10-12MSD, and SB10-23), were extracted on 17 October 1998.

Major Ed Marchand
23 April 1999
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Parsons ES has prepared a final report that incorporates the responses provided above. The final report has been provided under a separate cover. If you have any questions, have additional comments, or require additional information, please call Mr. John Hall at (970) 244-8829, or me at (303) 831-8100.

Sincerely,
PARSONS ENGINEERING SCIENCE, INC.


John Ratz, P.E.
Project Manager

cc: Mr. Paul Rekowski (Wurtsmith AFBCA/OL-T)
Mr. John Hall (Parsons ES-Grand Junction)
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Major Ed Marchand
23 April 1999
Page 7

REFERENCES

Parsons Engineering Science, Inc. 1998. Two-Year Soil Gas Sampling and *In Situ* Respiration Testing Results Report for the POL Yard, Sites SS-06 and ST-40, Wurtsmith Air Force Base, Michigan. November.